

partial differential equations, and the problem arises to develop a formula from which the solution, subject to boundary conditions, can be calculated. The problem can in any case be reduced to the discovery of what is now called a Green's function. To Poincaré is due perhaps the most feasible means yet devised for arriving at these functions. A general analytical theory has also been given by him of a somewhat different problem, required in theories of vibration and electrical oscillation. The diffraction of light has also been discussed by him in an elaborate memoir.

He has besides enriched pure mathematics with researches in the theory of numbers and on double integrals. In applied mathematics he has obtained remarkable results with regard to the figures which can be assumed by rotating fluid. To dynamical astronomy he has contributed, not only memoirs, but a monumental work in three volumes—"Les Méthodes Nouvelles de la Mécanique Céleste."

Finally, allusion may be made to the services which M. Poincaré has rendered to a number of branches of mathematical physics, by critical presentation of the work of others in published courses of lectures.

The officers and Council elected for the ensuing year were the Fellows whose names have already been given (p. 34), with two others to supersede two Fellows who found themselves unable to serve (p. 85).

On the evening of Saturday, the Fellows and their friends dined together in the Whitehall Rooms, when, to quote the *Times* report, "no Cabinet Minister and only one ex-Minister—Mr. John Morley—was present. Thus the calm discourse of the men of research was undisturbed by even the suggestion of political strife." It might also have been added that thus do Ministers of State manifest their indifference to associations having no political significance.

NOTES.

WE regret to announce the death of Sir William MacCormac, the distinguished president of the Royal College of Surgeons.

PROF. YVES DELAGE has been elected a member of the section of anatomy and zoology of the Paris Academy of Sciences in succession to the late Prof. Lacaze-Duthiers. Prof. Gouy, professor of physics in the University of Lyons, has been elected a correspondant of the Academy in succession to the late Prof. Raoult.

In response to appeals made by the Dover Chamber of Commerce to the Trinity House to place wireless telegraphy installations on the lightships in this part of the English Channel, an intimation has been received by the Chamber that the matter is under consideration by a special inter-departmental committee.

THE National Antarctic Exploration ship *Discovery* arrived at Lyttelton on Nov. 23. The ship has been dry-docked for caulking, having sprung a leak, though not a serious one.

MR. JONATHAN HUTCHINSON, F.R.S., is about to proceed to South Africa with the view to study the cause of leprosy. He will proceed to Robben Island, and will probably go on to Natal and Basutoland. His object is especially to obtain facts as to the use of dried and badly salted fish. Leprosy is a comparatively new disease in Cape Colony, and quite so in Natal and Basutoland. Thus these districts offer exceptional opportunities for ascertaining its cause.

THE Berlin correspondent of the *Times* reports that the German Imperial Estimates include the sum of 150,000 marks (7500*l.*) to be devoted to the prevention of tuberculosis and to the investigation of that disease. The sum will be largely applied to the promotion of research with the object of settling the question of the identity of tuberculosis in human beings and in animals. For the promotion of markets for agricultural produce and for the support of scientific, technical and kindred undertakings in the interest of agriculture a sum of 90,000 marks will be demanded, as against 50,000 marks last year.

EX-GOVERNOR EYRE, who died on Saturday at the age of eighty-six, was less known perhaps for his geographical work than for his action in connection with the disturbances in Jamaica thirty-six years ago. Yet he was an intrepid explorer, and in 1843 he received the Founder's Medal of the Royal Geographical Society for his explorations in Australia. He crossed the Australian continent overland from Sydney in the east to Swan River in the west, and investigated the then unknown shore of the Great Australian Bight between King George's Sound in Western Australia and Port Lincoln in South Australia. In 1845 he published the results of his explorations in a work entitled "Discoveries in Central Australia."

A SPECIAL expedition, under Dr. Charles Balfour Stewart, has just been sent by the Liverpool School of Tropical Medicine to the Gold Coast and to the gold-mining districts of that colony, to conduct a series of operations there with a view to improve the conditions of health and sanitation. Dr. Stewart was to have sailed for Cape Coast Castle on November 16, but his departure had to be delayed as the municipal authorities of Liverpool requisitioned his services to deal with an outbreak of plague in the city. The lines on which Dr. Balfour Stewart will proceed will be similar, so far as possible, to those now being followed by the Sierra Leone expedition of the Liverpool School under Dr. Logan Taylor.

THE death is announced of Mr. Samuel Rowles Pattison, who for some years was a member of Council of the Geological Society and its honorary legal adviser. In early life he resided at Launceston, where he made a collection of fossils from the limestone of Petherwin, and assisted by his local knowledge both De la Beche and John Phillips. He contributed papers on local geology to the *Transactions* of the Royal Geological Society of Cornwall and the Royal Institution of Cornwall from 1840 to 1860; and in the *Quarterly Journal* of the Geological Society of London he recorded the occurrence of auriferous quartz-rock in north Cornwall. In 1858 he published a work entitled "The Earth and the Word; or Geology for Bible Students." Mr. Pattison, who had attained the ripe age of ninety-two, died on November 27.

THE results of an analysis of the returns relating to the outbreak of small-pox in London are given in an article in Saturday's *Times*. There have been 349 completed cases, that is, cases which have ended in death or recovery, since May last. Of these 349 patients 181 were males and 168 females. The number of deaths was 116, and the rate of mortality was three times as great among the unvaccinated as among the vaccinated. The following points brought out by the classification of the cases are instructive:—(1) All the cases under five were unvaccinated, and out of 23 there were 19 deaths; (2) all the children under ten were unvaccinated except one, and out of 42 there were 29 deaths, all the deaths being of unvaccinated children; (3) out of a total of 81 children under fifteen years 57 were unvaccinated and 38 died. Only one death out of the 38 took place in a vaccinated child; of 24 vaccinated children 23 recovered. These facts show the fatality of the disease among young children and the protection afforded by primary vaccination against attack in the first instance and against a fatal result in the second. The protection diminishes progressively after childhood, but the rate of mortality remains enormously higher among the unvaccinated in every age period.

THE results of several series of experimental work in connection with the cultivation of hops were described at the conference of hop-growers held at the South-Eastern Agricultural College last week. The object of the meeting was to receive and discuss the reports of the various experiments upon hops that have been carried out by the College during the past

season. These experiments have in many cases been going on continuously on the same plots since 1895, so that the results are beginning to show a measure of consistency that is not immediately attainable in field trials. Training experiments at Wye are favourable, on the whole, to the systems of wide planting and broad alleys. The umbrella system of training has generally given the maximum weight per acre, but has various disadvantages compared with the Butcher system. Cutting the bine at picking time, as is done when hops are grown on poles or on some wire systems, is found to result in a considerable loss of material to the hop plant, and weakening and loss of crop in the succeeding year. Stripping off the lower leaves and laterals is found to be harmful in seasons of short growth and without effect when the plant is vigorous. Cultivation experiments at Goudhurst, where a plot has now carried a full crop for seven years though without any cultivation beyond surface hoeing, aroused considerable discussion; the trial is to be extended to other soils. Manurial experiments have been carried out on various soils in Kent and Surrey and deal chiefly with the use of mineral manures; the soil is shown to be the main factor in the results attained, especially in the cases where the cultivation has been extended from the typical hoplands to sandy or clay soils.

THE third number of vol. ii. of the *West Indian Bulletin* just received from Barbados, contains a good deal of useful information relating mainly to cacao and sugar-canes. Mr. Maxwell-Lefroy, entomologist to the Imperial Agricultural Department, has visited the island of Grenada to investigate the prevalence of an insect pest known as "thrips," affecting the leaves and pods of the cacao, and apparently to a less extent the leaves of cashew, guava and Liberian coffee. The insect is found also on cacao in the islands of St. Vincent, St. Lucia and Dominica, but is not known in any other part of the world. Thus far its depredations have not been of a very serious character, and to prevent its becoming a greater plague advice is given to the planters as to the methods which should be adopted to suppress it. Mr. Howard, the mycologist, deals with the fungoid diseases of cacao in the West Indies, summarising the results obtained by the Department in recent investigations. The subject is fully treated in three divisions—pod diseases, stem diseases and root disease. Mr. William G. Freeman, the technical assistant, in a note on the formation of cane-sugar in the sugar-cane, endeavours to give some idea of the possible sequence of events, but more investigation is necessary to clear up many doubtful points—we require to know, for instance, the first product of assimilation and the true relationship to each other of glucose and cane-sugar. Amongst other contributions are Sir W. T. Thiselton-Dyer's note on sugar-cane disease, and Mr. Noël Deerr's article on the distribution of the constituents of the sugar-cane in a Demerara factory and their utilisation as manure. There is an illustrated article on bud variation in the sugar-cane. Information has been collected from the various islands showing the planting and crop seasons of the sugar-cane. A full description of Barbados sour-grass, *Andropogon pertusus*, is given; and the desirability of introducing insectivorous birds from other countries to prey on the insect pests which cause so much destruction in the West Indies is discussed, but the conclusion arrived at seems to be in favour of encouraging the propagation of the local Barbados blackbird and to keep out the East Indian myna or starling, fearing the latter would become a worse pest than the insects.

A PRELIMINARY report of the international balloon ascents of June 13 has just been received. The places from which the ascents were made were Trappes (Paris), Chalais-Meudon, Strassburg, Berlin, Vienna, Pavlovsk (St. Petersburg), Moscow and Bath. In six cases the unmanned balloons were lost, or

the records are not forthcoming. The greatest altitude, 14,800 metres, was attained from Trappes, where the lowest temperature, $-51^{\circ}4$ C., was recorded. The ascent took place about 8h. a.m.; temperature at starting, $10^{\circ}4$, at 6090 m., -25° , at 10,900 m., -50° . At Strassburg the unmanned balloon ascended at 3h. 46 m. p.m., temperature 16° , and went through a thunder-storm cloud; at 2800 m. the temperature was 0° , at 4500 m. -10° , at 5400 m. -15° ; the greatest height reached was 5700 m., temperature -17° . Another balloon which ascended about the same time reached an altitude of 10,400 m. and the lowest temperature recorded was $-49^{\circ}9$. One of the balloons sent up from Berlin reached a height of 9315 m., temperature $-43^{\circ}5$. From Vienna an unmanned balloon left the earth at 8h. a.m., temperature 22° ; at 5000 m. -20° , and at 8900 m. -63° were recorded. Several manned balloons took part in the experiments; one of two from Vienna, carrying Archduke Leopold Salvator and Captain Hinterstoisser, ascended to 3400 metres, where a temperature of -4° was recorded.

MR. C. V. DRYSDALE communicated to the Institution of Electrical Engineers last week a description of a new form of permeameter for testing the magnetic qualities of iron and steel in bulk. A special form of hollow drill is used to drill a hole $\frac{5}{8}$ inch deep in the material to be tested; this hole has its upper part conical, and the small central pin left standing is $\frac{1}{16}$ inch in diameter. Into this hole fits a soft iron plug on the lower part of which are wound the magnetising and testing coils. There is thus formed a miniature permeameter in which nearly the whole of the magnetic circuit is of the material under test. By connecting the coils in the plug with suitably graduated instruments the permeability, retentivity and hysteresis may be very easily tested. Curves and figures which were published showed that the instrument gave very consistent results, although, as was pointed out in the discussion, they did not agree as well as they might with the values usually obtained by other permeameters. But the simplicity of the apparatus and the ease with which a test can be obtained (if, that is, the drills can be made to act with uniform accuracy) should give it considerable commercial value. The dynamo manufacturer requires chiefly a rough guide to the permeability of the casting he is going to use and does not need very rigid scientific accuracy, and such a guide Mr. Drysdale's instrument should be able to provide. In fact, any method which really only tests a very small portion of the bulk, whether *in situ*, as in this case, or after it has been cut off, can never be thoroughly satisfactory.

PROF. LEBEDEV, of Moscow University, describes in Drude's *Annalen der Physik* for November, 1901, a research by means of which he has succeeded in demonstrating experimentally the pressure of light. A translation of his paper is now appearing in the *Electrician*. It followed as a consequence of Maxwell's theory that the combined effect of the electrostatic and electrokinetic stresses is a pressure in the direction of the propagation of the wave numerically equal to the energy in unit volume, and Maxwell pointed out that "the concentrated rays of the electric lamp falling on a thin metallic disc, delicately suspended in a vacuum, might perhaps produce an observable mechanical effect." It was this effect that Sir William Crookes was thought to have obtained in his radiometer, but the magnitude proved many thousand times too great. Prof. Lebedew eliminated the radiometer action by using a large bulb with high exhaustion and by excluding rays capable of heating the tube walls. The radiometer vanes were of very thin aluminium foil suspended by a glass fibre, and the source of light the electric arc. The results obtained agree with the theoretical results of Maxwell within 10 per cent., and show that the pressure is directly proportional to the energy of the incident light and independent of the colour.

A CONCISE handbook of the geology of the city of New York has been published by Mr. L. P. Gratacap, of the American Museum of Natural History.

THE periodic variations of glaciers are dealt with by Dr. S. Finsterwalder and M. E. Muret in the sixth report of the International Commission on Glaciers (*Arch. Sc. Phys. et Nat.* Genève, tome xii., 1901).

"ICE CAVES and Frozen Wells as Meteorological Phenomena" is the title of a paper by Mr. H. H. Kimball (*Monthly Weather Review*, August 1901). The author's observations were made in New York co. and Vermont, and he concludes that the phenomena are due to the cold air of winter circulating to unusual depths below the surface and freezing the small quantity of water with which it comes in contact. The ice may not entirely disappear during the following summer, but continue under certain conditions to accumulate for ages.

IN the Memoirs of the Geological Survey of India (vol. xxi. part ii., 1901) there is a geological sketch of the Baluchistan Desert and part of eastern Persia, by Mr. E. Vredenburg. The rocks comprise marine strata ranging in age from Upper Cretaceous to Upper Eocene. Interbedded with them is a large proportion of volcanic rocks, and these, together with numerous igneous intrusions, form the chief hill masses. Considerable areas are occupied by Siwalik strata, land deposits of Miocene age, which consist of conglomerates, friable sandstones, and clays frequently white or brightly coloured in various tints of pale terra-cotta, ochre or green. Much of the low ground is concealed by modern alluvium and sand dunes. Except in the unusual event of a storm the plains are absolutely dry, and when such an occurrence takes place the flood seldom lasts more than an hour. Then the water rushes through a network of irregular and ever-shifting furrows, rolling along with it large boulders which rattle loudly as they come into collision. These floods by their suddenness constitute a source of danger to the flocks, especially to sheep and goats, which may be carried away if not driven off in time by the shepherds. In the western portion of the country examined there are several recent volcanoes, one of which still shows signs of activity.

THE artesian waters of Australia were dealt with by Mr. J. P. Thomson in a paper read at a recent meeting of the Royal Geographical Society of Australia. Although the whole of the Australian colonies have taken an active part in the somewhat minute and altogether elaborate search for artesian water, it is to Queensland that the greatest credit is due for having discovered the existence of an unlimited and practically inexhaustible supply in the lower cretaceous formation that underlies the vast rolling downs of the western portion of that State. Several of the inland towns and many parts of the western district are now watered by numerous artesian wells or bores. In some remarks upon the subject, the president of the Society, Sir Hugh Nelson, pointed out that up to the present time the amount of artesian water brought to the surface at the bores has had very little effect as an irrigating agent upon the great areas of land in the west during seasons of drought. This water is valuable for drinking purposes for stock, but stock cannot exist upon water alone—they require herbage, and the supply of water is not plentiful enough to irrigate the runs. The Hon. A. C. Gregory also explained that artesian water contains a small percentage of saline matter, and while it might be used for irrigating small areas of cultivation the saline properties of the water have the reverse or a beneficial effect upon the land when the water is used to irrigate large tracts of country.

WE have received a copy of "A Catalogue of Crustacea and Pycnogonida in the Museum of University College, Dundee," by Prof. d'Arcy W. Thompson. The list is a long one.

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THE Egyptian Government has just issued a series of "Notes for Travellers and Sportsmen in the Sudan." These give full information with regard to the game of the country and the conditions under which it may be killed. The regulations for the protection of the rarer species seem well calculated to attain the end in view—at least for a time.

THE nesting and other habits of one of the North American cat-fishes of the genus *Amiurus* forms the subject of a paper, by Mr. A. C. Eycleshymer, in the *American Naturalist* for November. "Although repeated efforts were made," writes the author, "to find the nests, they were unsuccessful until June 8, 1896, when three nests were found in Fowler Lake, Wisconsin. Two of these were in pieces of stovepipe, the third in an old pail. The nests were in clear water, near a bold rocky shore, and at a depth of four or five feet; all contained embryos, and each was guarded by a parent fish—which one I did not ascertain."

THE latest issue of the *Zeitschrift für Wissenschaftliche Zoologie* (vol. lxx. pt. iii.) contains two papers, one, by Dr. R. Hesse, on the eyes of arthropods (being the seventh of a series on the visual organs of invertebrates), and the second, by Herr C. Rabl, on the origin of limbs. In the latter memoir much attention is devoted to the question whether fins, as Gegenbaur thought, are derived from modified gill-arches, or whether, as suggested by Balfour and Thacher, from lateral folds, the author favouring the latter view. The diagrams illustrating the various modifications of carpal and tarsal structure in the lower vertebrates are especially interesting.

TO the November number of the *American Naturalist* Mr. H. L. Osborne communicates some interesting notes on axolotls from Colorado and Dakota. Two kinds of metamorphosis occur during the passage of these creatures from an aquatic to a terrestrial existence, first of all in the development of the limbs and lungs, the alteration of the circulatory system and the maturation of the reproductive organs. But there are also secondary changes, which may occur either early or late in life. In some districts axolotls pass into the adult amblystoma state when quite small; but in Mexico the secondary changes never take place at all, so that the animal, although adult in other respects, remains in the aquatic condition throughout life.

AN important paper in the November issue of the *Quarterly Journal of Microscopical Science* is one by Mr. E. S. Goodrich on the pelvic girdle and fins of the "fringe-finned ganoid" fish *Eusthenopteron*. The specimen on which the communication is based is from the Devonian of Canada, and is preserved in the British Museum. It is remarkable as being the only known example among the numerous remains of the extinct representatives of the group in question in which the pelvis and fins are preserved in a complete state and showing their natural relations to one another. Although the structure of the fin-rays shows a curious approximation to the type of the more specialised modern bony fishes, in other respects the pelvic fins of this fish show signs of being derived from a type allied to that which persists in the Queensland lung-fish (*Ceratodus*). Another article in the same journal, by Mr. E. P. Allis, deals with certain parts of the anatomy of the small shark known as *Mustelus laevis*.

THE *Transactions* of the New Zealand Institute for 1900 contain a large number of papers on the zoology of the colony, as well as others connected with acclimatisation and stock-breeding. Among the former, reference may be made to Prof. Benham's description of the New Zealand lancelet, of which only two examples appear to be known. This form is now referred to the genus *Heteropleuron*, the commonest type of the group in the southern hemisphere under the name of *H. hectori*. In

two other communications the same writer discusses the New Zealand earthworms, describing three new species, under as many generic heads. Prof. Dendy and Miss Olliver jointly describe a new freshwater leech of the genus *Glossiphonia*, while the former contributes a fourth paper on the land planarians of the colony.

THE acclimatisation and variation of Salmonidæ in New Zealand form the subject of a paper in the *Transactions* of the New Zealand Institute for 1900 by Mr. A. J. Rutherford, in which it is concluded that greater success is likely to attend the introduction of the north Pacific salmonoids than that of *Salmo salar*, which is a more delicate fish, unlikely to find what it requires in an ocean so far removed from its native habitat. In regard to trout, the author is of opinion that "whatever variety we liberate of the ordinary species of trout, it will develop into a *Salmo novae-zealandiæ*, suited to the water in which it is liberated, and corresponding with trout in similar localities in the Northern Hemisphere more closely than with the varieties found in the more northern latitudes of our mother-country." Considerable interest also attaches to a paper by Mr. T. White on breeding black merinoes, of which there are now several flocks in the colony. Although the wool does not fetch so high a price as the best selected white it is really more valuable, as the price is the same for the whole fleece.

A CIRCULAR which we have just received from Messrs. Hirschberg and Oestergaard, Berlin, provides us with another example of German enterprise. This firm has produced a large wall map of the British Isles and of the world, showing the British colonies in a distinctive colour, and special offers are being made to English newspapers to take up the map and sell it to their readers. The map is 53 in. by 42 and is printed in twelve colours. In a space left at the top the title of the newspaper adopting the map, and other particulars of local interest, will be inserted as desired. As a number of newspapers have taken up the map there is apparently no objection to its German origin. But how is it that our geographical publishers cannot make similar arrangements with newspapers, and so prevent, in a sense, the war from being carried into our own country? It certainly seems strange that Germany should find it worth while to supply us with cheap maps of the British Isles and the Empire.

THE "Year Book of the Scientific and Learned Societies" (London: C. Griffin and Co., Ltd.) is a very handy guide to organisations existing in the British Isles for the promotion of knowledge. The societies and other institutions are arranged in fourteen different departments, according to their objects, and particulars are given as to officers, meetings, conditions of membership, and publications of each. In addition, lists are given of papers read before each society from January, 1900, to June of the present year. The reason why the papers read during eighteen months are catalogued instead of those read in a calendar year is that it is intended in future to make the Year Book correspond as closely as possible with the sessional year of the societies dealt with in it. Subsequent volumes will therefore record the papers read before each society between September and June, and they will be published as early as possible in the succeeding session. This change will be an additional convenience to those who use the Year Book as a manual of ready reference or a general review of Great Britain's annual contributions to scientific knowledge.

THE work of John Mayow, a pupil of Robert Boyle, was touched upon by Dr. J. B. Cohen, in an address recently delivered before the Yorkshire College Scientific Society. Mayow was certainly a genius, and some of his observations are remarkable for their shrewdness and depth, but they have often been misrepresented, and Dr. Cohen gives some interpretations of

them which should interest students of the history of chemistry. His treatise on combustion was completed before the birth of the phlogiston theory, and was revived a century later, after Priestley had discovered oxygen, and the phlogiston theory was breaking down. Referring to Mayow's experiments on hydrogen and nitric oxide, Dr. Cohen remarks, "it must suffice to say that he anticipated Priestley in recognising both these as distinct kinds of gases, differing from, but possessing the same elasticity as air. Although Priestley's view of the composition of dephlogisticated air has much in common with that of Mayow's nitro-aërial particles, there is plenty of evidence to show that Priestley's ideas were formed quite independently. It must be admitted, however, that they show little advance on those of a whole century before."

THE recent work of M. Moissan on the properties of pure calcium has shown that the description of this element current in the text-books was by no means an accurate one, and from the work of M. Guntz, published in the current number of the *Comptes rendus*, it would appear that the properties of pure barium also differ considerably from those hitherto assigned to it. The starting point of the work is barium amalgam, and by the electrolysis of a saturated solution of barium chloride with a mercury cathode it would appear to be quite easy to prepare several kilograms of a 3 per cent. barium amalgam. It is the separation of the mercury from this amalgam which has proved to be such a difficult matter. M. Maquenne, for instance, who attempted to distil off the mercury, was quite unable to obtain a coherent ingot of barium in this way. M. Guntz has found that the secret of success in this experiment is to apply the heating gradually; the amalgam is placed in an iron boat in a wide porcelain tube and the tube heated by a coil of fine platinum wire, brasqued by a protecting coating of alumina and magnesia. By means of this electric furnace it has been found possible to raise the temperature as slowly as 200° C. per hour, and finally to maintain the tube, 50 mm. in diameter and 300 mm. long, at 1200° to 1300° C., with an expenditure of 600 to 700 watts. Working in this way a good yield of pure barium has been obtained at 1000° C. The barium thus obtained when freshly cut has a white silvery lustre; it is soft, a little harder than lead, and is extremely oxidisable in the air, often catching fire when attempting to remove it from the boat by means of a hard body. It resembles lithium and calcium in dissolving in liquid ammonia, and attacks easily water, alcohol and even an alcoholic solution of baryta.

THE additions to the Zoological Society's Gardens during the past week include a Green Monkey (*Cercopithecus callitrichus*) from West Africa, presented by Dr. A. E. Neale; two Short-eared Owls (*Asio brachyotus*), one Short-eared Owl (*Asio brachyotus*), European, presented respectively by Mr. W. Jamrach and Mr. C. W. Burnett; a Variegated Sheldrake (*Tadorna variegata*) from New Zealand, purchased.

OUR ASTRONOMICAL COLUMN.

THE NEW STAR IN PERSEUS.—Sir Norman Lockyer recently communicated to the Royal Society some further observations of the new star in Perseus made at the Solar Physics Observatory in continuation of the last previously recorded (*Roy. Soc. Proc.*, vol. lxviii. p. 399). In the present paper, which brings the information up to the end of September, it is first pointed out that the short period light variations have ceased and that the Nova was gradually becoming fainter, reaching about magnitude 6.7. In the visual spectrum the nebular line at wave-length 5007 was the strongest. Photographs of the spectrum showed that since last April a great change has taken place. The lines then were very broad and ill defined, but are now much narrower with better defined edges. The lines of hydrogen, which were the strongest in the spectrum have become comparatively very